USGS

Sound Waves

Coastal Science and Research News from Across the USGS

http://soundwaves.usgs.gov/

Fieldwork

Marine Geophysical Survey of the Virgin Islands Platform Aids in Tsunami-Hazard Assessment

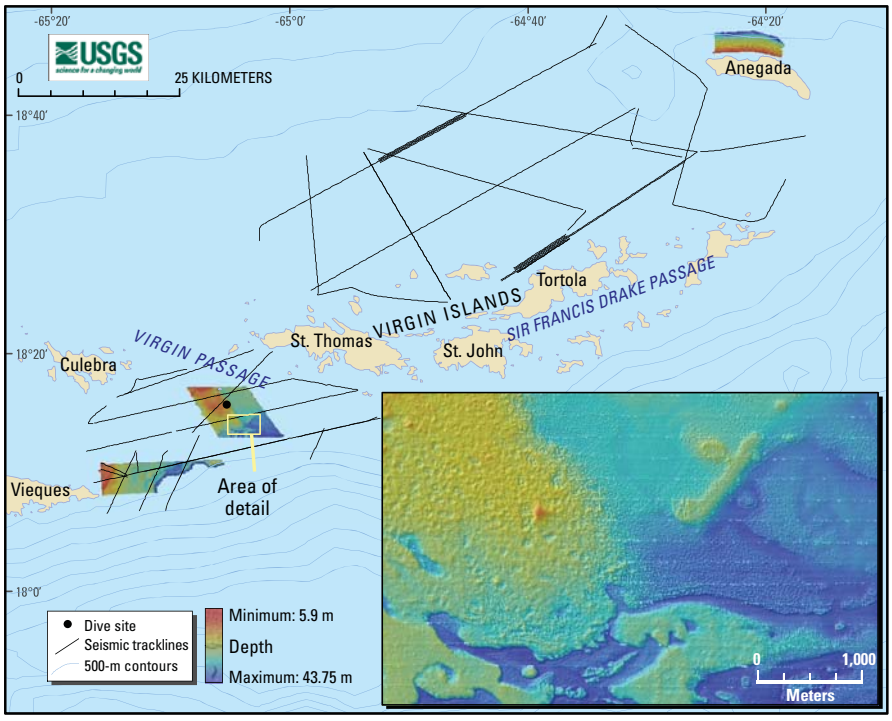
By Uri ten Brink and Brian Andrews

The November 18, 1867, Virgin Islands earthquake and tsunami are an example of a natural disaster that changed the course of local history. At the time of the event, the United States was engaged in the purchase of the Virgin Islands from Denmark and had sent three Navy ships to explore the islands. The devastating tsunami, which caused loss of lives and damage to the Navy ships and the islands' settlements, was among the reasons the purchase was postponed for another 50 years. The location of the rupturing fault has not been determined because the earthquake predated instrumental recording.

The U.S. Virgin Islands are now densely populated, and some of the harbors and bays affected by the tsunami have tourist and fueling facilities. Therefore, the identification of potential faults in the vicinity of the islands is important for assessing earthquake and tsunami hazards. So, too, is the identification of ongoing tectonic deformation that could trigger fault rupture. Data from a global-positioning-system (GPS) station recently installed by the U.S. Geological Survey (USGS) on the island of Anegada, at the northeast end of the Virgin Islands, indicate that Anegada is moving westward with respect to St. Thomas, suggesting that tectonic deformation is occurring north of the Virgin Islands.

A marine geophysical survey to study potential tectonic deformation of the shallow seafloor, or "platform," surrounding the Virgin Islands was conducted by **Brian Andrews**, **Emile Bergeron**, **Bill Danforth**, **Uri ten Brink**, and **Chuck Worley** of the USGS Woods Hole Coastal and Marine Science Center onboard the

(Virgin Islands continued on page 2)



Survey area around the Virgin Islands. Colored areas, multibeam bathymetry at water depths ranging from approximately 6 to 44 m (red, shallow; blue, deep).

Fishing vessel Tiki XIV *used for recent research.*

Sound Waves

Editor
Helen Gibbons
Menlo Park, California
Telephone: (650) 329-5042
E-mail: hgibbons@usgs.gov
Fax: (650) 329-5190

Print Layout Editors
Susan Mayfield, Sara Boore
Menlo Park, California
Telephone: (650) 329-5066
E-mail: smayfiel@usgs.gov; sboore@yahoo.com
Fax: (650) 329-5051

Web Layout Editor
Jolene Shirley
St. Petersburg, Florida
Telephone: (727) 803-8747 Ext. 3038
E-mail: jshirley@usgs.gov
Fax: (727) 803-2032

SOUND WAVES (WITH ADDITIONAL LINKS) IS AVAILABLE ONLINE AT
http://soundwaves.usgs.gov/

Contents

Submission Guidelines

Deadline: The deadline for news items and publication lists for the November issue of *Sound Waves* is Tuesday, September 15.
Publications: When new publications or products are released, please notify the editor with a full reference and a bulleted summary or description.
Images: Please submit all images at publication size (column, 2-column, or page width). Resolution of 200 to 300 dpi (dots per inch) is best. Adobe Illustrator© files or EPS files work well with vector files (such as graphs or diagrams). TIFF and JPEG files work well with raster files (photographs or rasterized vector files).

Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

U.S. Geological Survey
Earth Science Information Sources:

Need to find natural-science data or information? Visit the USGS Frequently Asked Questions (FAQ's) at **http://www.usgs.gov/faq/**

Can't find the answer to your question on the Web? Call 1-888-ASK-USGS

Want to e-mail your question to the USGS? Send it to this address: ask@usgs.gov

Fieldwork, continued

(Virgin Islands continued from page 1)

80-ft-long fishing vessel *Tiki XIV* between March 24 and April 10, 2009. The scientists collected 1,311 linear km of swath bathymetric (depth) data with a SwathPlus interferometric sonar and 821 km of high-resolution shallow seismic profiles (cross-sectional views of sediment layers beneath the seafloor) with a minisparker seismic system and hydrophone (underwater microphone). The ship's captain, **Drexel (Stormy) Harrington**, his son, **Drexel Jr.**, and **Chuck Worley** made a scuba dive on a suspected fault scarp at water depths of 25 to 35 m southwest of St. Thomas to collect photographs and video footage.

High-resolution bathymetry (with a grid resolution of 5 m) and seismic profiles (with a 2.5-m trace interval and penetration as deep as 50 m below the seafloor) show that the platform region southwest of St. Thomas is covered mostly by dense coral reefs alternating with sandy patches (see inset on map, page 1). The scuba dive provided a direct view of the corals and showed that they consist mostly of *Agaricia agaricities* (lettuce coral) and possibly some *Agaricia humilis*. North of the Virgin Islands, the seafloor is likely covered by carbonate sand with only a few patches of reefs. Faults were not detected on the shallow platform either north or south of the islands; in particular, no evidence was found for a fault southwest of St. Thomas in either the seismic data or the dive observations,

(Virgin Islands continued on page 3)

*Pole with interferometric-sonar transducers (yellow) at near end and two global-positioning-system (GPS) antennas at far end, used to collect bathymetric (depth) data. During operation, the pole swings over the rail and is attached to the side of the boat so that the transducers are 2 m below the waterline. The transducers emit fan-shaped beams of sound energy that reflect from a swath of seafloor as the vessel moves forward; depths are calculated from the time it takes the sound energy to travel from the transducers to the seafloor and back. (Read more about bathymetry systems at **http://woodshole.er.usgs.gov/operations/sfmapping/bathy.htm**.)*

***Chuck Worley** photographs a suspected fault scarp. Photograph from video footage by **Drex Harrington**.*

(Virgin Islands continued from page 2)

despite visible bathymetric relief on the seafloor. Such a fault had been suggested by **Thomas W. Donnelly** in a 1965 paper titled "Sea-Bottom Morphology Suggestive of Post-Pleistocene Tectonic Activity of the Eastern Greater Antilles" (Geological Society of America Bulletin, v. 76, no. 11, p. 1291-1294, **http://gsabulletin.gsapubs.org/content/76/11/1291.abstract**). The absence of evidence for tectonic deformation indicates either that deformation is not occurring in this area or that its average rate is slower than the growth rate of *Agaricia* corals, which can reach a height of 1 to 1.5 m in 100 years.

The multibeam bathymetric data collected in this survey will contribute to construction of an accurate bathymetric grid by the National Oceanic and Atmospheric Administration (NOAA) and the USGS, which is needed to model tsunami propagation into the Virgin Islands. For example, data from north of the island of Anegada are being incorporated by NOAA's Pacific Marine Environmental Laboratory (PMEL) into a model of tsunami runup on Anegada from the 1755 Lisbon earthquake. Evidence for overwash of the island within the past 500 years, likely from a tsunami, was recently discovered by a USGS team headed by **Brian Atwater** (view abstract at **http://adsabs.harvard.edu/abs/2008AGUFMOS53B1310A**).

***Chuck Worley** trims the edges of the copper wires of the minisparker. Towed behind the vessel, this device produces an electric spark that vaporizes a small volume of water. Rapid expansion of the vapor bubble generates a sharp pulse of sound that penetrates beneath the seafloor and is reflected from boundaries between sub-seafloor sediment layers. The returning echoes are picked up by a hydrophone (underwater microphone). (Read more about seismic-profiling systems at **http://woodshole.er.usgs.gov/operations/sfmapping/seismic.htm**.)*

High seas and technical challenges slowed data collection at the start of the cruise, but calm seas allowed continuous and efficient operation during the rest of the cruise. The downtime was used to invite representatives from local institutions to visit the ship, learn about the USGS work, and exchange data and experience. Professors **Roy Watlington** and **Tyler Smith** and diving supervisor **Steve Prosterman** from the University of the Virgin Islands visited the vessel in Charlotte Amalie, St. Thomas; and Senior Technical Planning Manager **Cindi Rolli-Kelley** from the Department of Disaster Management of the British Virgin Islands visited the vessel in Road Town, Tortola. The professional and dedicated efforts of captain **Drexel (Stormy) Harrington**, his son, **Drexel Jr.**, and **Stormy's** wife, **Bev**, not only assured the success of the survey but also made the work very pleasant.❁

2009 Spring Survey Shows Drop in California Sea Otter Numbers

By Tim Tinker, Brian Hatfield, and Gloria Maender

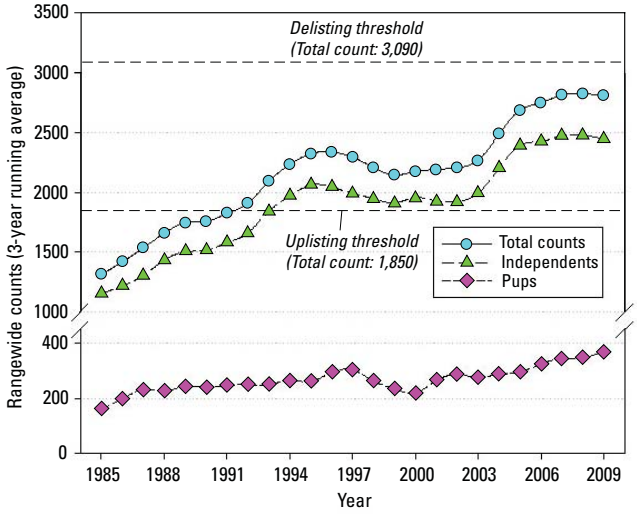
The sluggish recovery of the southern sea otter of California, a threatened population on the Endangered Species list, appears to have stalled once again.

U.S. Geological Survey (USGS) scientists say the latest 3-year running average (2,813 sea otters) was 0.5-percent lower than last year, the first time the trend has been negative since the late 1990s. A leveling off of population growth has occurred over the past 3 years.

For southern sea otters to be considered for removal from the Endangered Species list, the 3-year running averages would have to exceed 3,090 for 3 continuous years, according to the U.S. Fish and Wildlife Service's Southern Sea Otter Recovery Plan.

"This slight dip of the sea otter growth trend has happened before, most recently in

(Sea Otter Survey continued on page 4)



Number of southern sea otters counted during spring surveys, plotted as 3-year running averages (for example, values for 2008 are averages of the 2006, 2007, and 2008 counts). The southern sea otter in California is a threatened population on the Endangered Species list. For southern sea otters to be considered for delisting, the 3-year running averages for total counts would have to exceed 3,090 for 3 consecutive years.

(Sea Otter Survey continued from page 3)

the mid- to late 1990s, so hopefully this will be just a brief setback to the recovery of the population," said survey organizer **Brian Hatfield**, a USGS biologist in California. "The fact that the pup counts have continued to increase slowly is encouraging."

The latest 3-year average was obtained by combining the spring census totals from the years 2007, 2008, and the recently completed spring 2009 census. During the 2009 census, observers counted 2,654 California sea otters, 3.8-percent fewer than the 2008 spring count of 2,760. Scientists use 3-year running averages of spring census totals to assess population trends because these averages are more reliable than individual year totals, which can vary with weather conditions, sea otter distribution, and other factors.

"This year's census results demonstrate that sea otters continue to experience levels of mortality sufficient to limit their recovery," said **Tim Tinker**, lead scientist for the USGS sea otter research program in California (**http://www.werc.usgs.gov/otters/**). "This highlights the need for continued efforts to understand and mitigate threats to sea otters and other species in the nearshore ecosystem." Ongoing research by USGS scientists and research partners is aimed at determining important sources of mortality in sea otters and the underlying reasons for the sluggish rate of recovery and varying population trends.

"One interesting finding this year was that the big male groups that we have seen at the extreme ends of the range over the last 5 years were largely missing on this survey," pointed out **Hatfield**, "which raises questions about the factors driving sea otter distribution and behavior." Some of the variation in numbers at smaller scales reflects movements of animals between areas, especially in the case of males. For example, numbers were higher this year in Estero Bay but lower southeast of Point Conception. USGS studies of radio-tagged animals have shown that males frequently move long distances between the range peripheries and sandy embayments, such as Estero Bay, Pismo Beach, and Monterey Bay.

"The apparent redistribution of males this year from the ends of the range to areas well within the existing range demonstrates that range expansion is not a steady progression into new areas but rather a more dynamic process involving advances and retreats," said **Lilian Carswell**, Southern Sea Otter Recovery and Marine Conservation Coordinator with the U.S. Fish and Wildlife Service.

The spring 2009 California sea otter survey, conducted between May 4 and June 11, covered more than 375 mi of the California coast. The census results provide counts used to evaluate trends and are not absolute population estimates. The census is a cooperative effort of the USGS, the California Department of Fish and Game's Marine Wildlife Veterinary Care and Research Center, the Monterey Bay Aquarium, the U.S. Fish and Wildlife Service, and many experienced and dedicated volunteers. The information gathered from spring surveys is used by Federal and State wildlife agencies in making decisions about the management of this small sea mammal.❁

*Female sea otter off Cannery Row in Monterey, California, with her pup lying across her stomach. Running averages of pups counted in spring surveys continue to increase slowly. Photograph by **Nicole LaRoche**, University of California, Santa Cruz; used with permission.*

Geologic Mapping of Massachusetts Seafloor Includes USGS Summer Intern

By Walter Barnhardt

Personnel from the U.S. Geological Survey (USGS) Woods Hole Coastal and Marine Science Center in Woods Hole, Massachusetts, mapped approximately 350 km^2 of seafloor in Buzzards Bay and Vineyard Sound off Massachusetts in May and June 2009. The survey was part of a cooperative mapping project involving the USGS and the Massachusetts Office of Coastal Zone Management. The project's objectives are to provide a framework for scientific research and to develop geologic information for the management of coastal and marine resources. Generating accurate maps of seafloor geology and bathymetry are important first steps toward protecting benthic habitats, delineating marine reserves, and assessing environmental changes caused by natural or human impacts. Read more about this effort in "Massachusetts Sea-Floor Mapping Project Expands to South Shore and Cape Cod Bay," *Sound Waves*, November/December 2006, **http://soundwaves.usgs.gov/2006/11/fieldwork4.html**.

(Massachusetts Mapping continued on page 5)

*USGS intern **Danijela Vesovic** on the deck of the research vessel* Megan Miller *off the Massachusetts coast. Behind her are **David Foster** (left) and **William Danforth** (right).*

(Massachusetts Mapping continued from page 4)

The team used an interferometric sonar to map bathymetry (seafloor topography) and backscatter (intensity of sound energy reflected from the seafloor, which provides information about surficial materials); a sidescan sonar to collect additional backscatter data; and a chirp seismic-reflection profiler to map stratigraphy and structure (geometry of sub-seafloor layers). Marine technicians **Emile Bergeron**, **Tom O'Brien**, and **Brent Taylor** operated the three geophysical systems and ensured that the acquired data were of the highest possible quality. **Barry Irwin** set up and maintained a global-positioning-system (GPS) navigation station on shore.

Danijela Vesovic, a student intern from the City College of New York (CCNY), joined the mapping survey while it was underway. **Vesovic** has a B.S. in physics and is working toward an M.S. in Earth and atmospheric science, with a focus on linking groundwater resources with the geologic framework of the coastal zone. Her summer internship was made possible through a CCNY-USGS cooperative program designed to increase the diversity of the USGS workforce. **Vesovic** quickly adapted to shipboard life on the research vessel *Megan Miller*, standing regular 12-hour watches on the second leg of the cruise and processing acoustic data alongside **David Foster**, **Bill Danforth**, **Wayne Baldwin**, and **Brian Buczkowski**. The first leg of the cruise was staffed by researchers **Walter Barnhardt**, **Brian Andrews**, and **Seth Ackerman**.

(Left to right) ***Captain Brad Pimer***, ***Brent Taylor***, ***Emile Bergeron***, ***Brian Andrews***, *and* ***Dwayne Popkin*** *launch a chirp seismic-reflection profiler, which will be towed behind the ship. The yellow pontoons allow for operations in shallow water by floating the system just below the sea surface.*

Catalina or Bust: USGS Group Maps Faults Offshore of Los Angeles

By Jamie Conrad and Holly Ryan

Despite mercurial motherboards, an overheating minisparker system, and having to avoid cargo ships and weekend yacht traffic, the intrepid crew of the research vessel *Parke Snavely* conducted a successful cruise to study faults offshore of Santa Catalina Island, which lies about 25 mi southwest of Los Angeles, California.

The survey, part of the Earthquake and Tsunami Hazards Project, collected high-resolution seismic-reflection profiles (cross-sectional views of sub-seafloor sediment layers) to assess the recentness of fault motion and the potential for earthquake and tsunami hazards. The high-resolution data were collected with two systems that emit pulses of sound energy that penetrate beneath the seafloor and reflect off the boundaries of sub-seafloor layers:

- a 50-tip minisparker as the sound source and a short, single-channel hydrophone (underwater mi-

(Santa Catalina continued on page 6)

USGS research vessel Parke Snavely *moored off Santa Catalina Island. Photograph by* ***Holly Ryan****.*

(Santa Catalina continued from page 5)

crophone) streamer to record the echoes; and

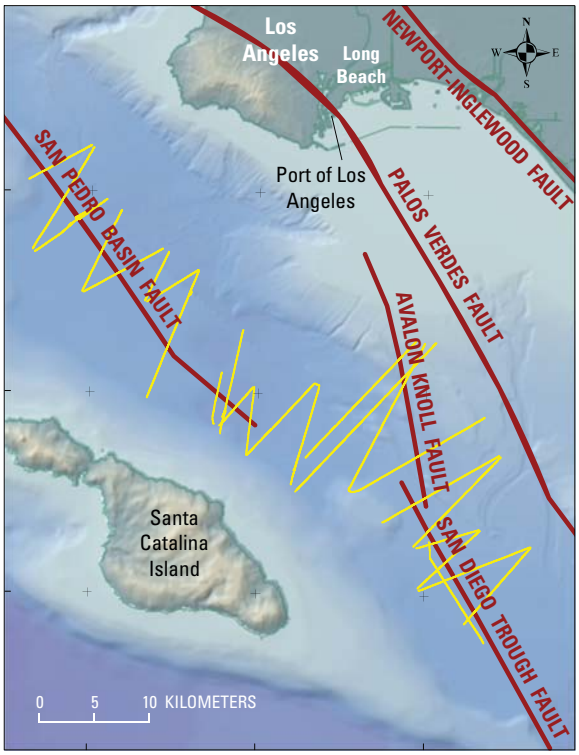
- an Edgetech 512i subbottom-profiling system composed of a high-frequency "chirp" sound source and a small hydrophone array, all housed within a 190-kg "fish" towed 3 to 5 m below the sea surface.

These systems are described in more detail in the article "Surveying Faults and Sediment Outside the Entrance to San Francisco Bay" (*Sound Waves*, March 2007, **http://soundwaves.usgs.gov/2007/03/**).

Thanks to the skills of skipper **Pete Dal Ferro** and engineering whiz kid **Gerry Hatcher**, we collected 208 km of mini-sparker data and 45 km of chirp data over a 5-day period in July 2009. Generally smooth seas and sunny days assisted the effort, which was led by co-chief scientists **Jamie Conrad** and **Holly Ryan** with assistance from lead geophysicist **Ray Sliter**.

Our study focused on the connection between the San Diego Trough fault and the San Pedro Basin fault offshore in the Southern California Continental Borderland. These faults are of particular interest as both earthquake and tsunami hazards, especially to the Port of Los Angeles. The San Diego Trough fault is a major strike-slip fault that extends about 150 km, from south of the Mexican border near Punta Santo Tomás to near Crespi Knoll, which is about 40 km offshore of San Clemente, California. The San Pedro Basin fault had been previously mapped as extending from off of Santa Catalina Island northward to near Point Dume. Multichannel seismic-reflection data collected by the USGS several years ago, together with high-resolution data collected in 2008 east of Santa Catalina Island, suggest that the San Diego Trough fault and the San Pedro Basin fault might connect at depths of about 100 to 200 m below the seafloor. One of our goals in collecting higher resolution data during the July 2009 cruise was to determine whether such a connection was apparent at or near the seafloor, which would indicate recent offset along this fault segment. Initial results suggest that the San Pedro Basin fault does not extend far enough southward to make a simple connection with the San Diego Trough fault. Instead, the San Diego Trough fault appears to terminate in a series of complex folds and faults, possibly transferring some slip eastward onto the Avalon Knoll fault or the Palos Verdes fault. How slip might transfer onto the San Pedro Basin fault to the north remains unclear.

***Jamie Conrad** (left) and **Gerry Hatcher** prepare to pull subbottom-profiling system back onto the deck of the* Snavely. *Photograph by **Holly Ryan**.*



Survey area (large map). Thin yellow lines, tracklines of July 2009 cruise. Small map shows location of survey area and other places named in text.

We thank the Southern California Marine Institute (SCMI) for logistical assistance and the use of their dock facilities in Los Angeles, and the Philip K. Wrigley Marine Science Center (University of Southern California) for housing both the *Snavely* and the crew on Santa Catalina Island.

What Science Says About Beach Sand and Stomach Aches

By Meredith Nevers, Richard L. Whitman, and Diane Noserale

By washing your hands after digging in beach sand, you could greatly reduce your risk of ingesting bacteria that could make you sick. In new research, scientists have determined that although beach sand is a potential source of bacteria and viruses, hand rinsing may effectively reduce exposure to microbes that cause gastrointestinal illnesses. These findings were published recently in the *Journal of Water and Health* (v. 7, no. 4, p. 623-629, **http://dx.doi.org/10.2166/wh.2009.115**)

"Our mothers were right! Cleaning our hands before eating really works, especially after handling sand at the beach," said **Richard Whitman**, the lead author of the U.S. Geological Survey (USGS) study. "Simply rinsing hands may help reduce risk, but a good scrubbing is the best way to avoid illness."

For this study, scientists measured how many *E. coli* bacteria could be transferred to people's hands when they dug in sand. They analyzed sand from the shores of Lake Michigan in Chicago. Using past findings on illness rates, scientists found that if individuals were to ingest all of the sand and the associated biological community retained on their fingertip, 11 individuals in 1,000 would develop symptoms of gastrointestinal illness. Ingestion of all material on the entire hand would result in 33 of 1,000 individuals developing gastrointestinal illness.

In a further laboratory experiment, USGS scientists determined that submerging one's hands four times in clean water removed more than 99 percent of the *E. coli* and associated viruses from the hands.

In recent years, USGS scientists have discovered that concentrations of *E. coli* bacteria in beach sand are often much higher than those in beach water. Follow-up research at beaches around the Nation by many scientists has produced similar results, although the amount of bacteria in sand varies depending on the beach. Although beach water is monitored for *E. coli* as mandated in the Beaches Environmental Assessment and Coastal Health Act (BEACH Act 2000), beach sand is not currently monitored for contamination.

Playing in the sand on a Lake Michigan beach. USGS scientists have determined that although beach sand is a potential source of bacteria and viruses, hand rinsing may effectively reduce exposure to microbes that cause gastrointestinal illnesses.

Recent analysis of seven beaches across the Nation by the University of North Carolina at Chapel Hill and the U.S. Environmental Protection Agency showed that beachgoers digging in sand were more likely to develop gastrointestinal illness after a day at the beach than those not digging in sand. The association with these illnesses was even stronger for individuals who reported being partly covered up in sand. Because children played in the sand more frequently and were more likely to get sand in their mouths, they were more likely to develop gastrointestinal illness after a day at the beach.

"The excess illnesses we observed among those exposed to sand generally consisted of mild gastrointestinal symptoms, but it is a good idea to be sure to wash your hands or use hand sanitizer after digging or playing in the sand," said **Chris Heaney**, lead author of the University of North Carolina study, which has been published in the *American Journal of Epidemiology* (v. 170, no. 2, p. 164-172, **http://dx.doi.org/10.1093/aje/kwp152**).

E. coli is an indicator of recent sewage contamination, and if it is present, pathogens harmful to human health also are likely present. The origin of these bacteria is often unknown. They can persist throughout the swimming season, remaining a potential contamination source to beach visitors.

The results of these studies highlight the need to intensify efforts to determine the sources of microbial contamination to beaches and the associated risk of playing in beach sand.

Meetings

USGS and Association of American State Geologists Host Workshop on Data-Preservation Techniques

By Brian Buczkowski
[revised November 2009]

Workshop participants on the steps of the Indiana Geological Survey. Photograph courtesy of the Indiana Geological Survey.

In mid-July, the U.S. Geological Survey (USGS) National Geological and Geophysical Data Preservation Program (NGGDPP), in collaboration with the Association of American State Geologists, hosted a workshop on techniques for preserving geoscience data. This 2-day workshop, which brought together data-preservation specialists from the USGS and State geological surveys, served as a forum for sharing successful cataloging and data-management practices and provided education and information on implementing data-preservation standards at the participating surveys.

Hosted by the Indiana Geological Survey at Indiana University, Bloomington, the workshop provided participants with opportunities to give presentations about their data-preservation strategies and projects involving data and sample management and to discuss improvements. **John Steinmetz** of the Indiana Geological Survey and **Frances Pierce** of the USGS in Reston, Virginia, co-organized the event. **Steinmetz** began the workshop with an overview of the NGGDPP, detailing its origin, current goals, and future directions. **Pierce** then spoke about the reasoning for holding the Geoscience Data Preservation Techniques Workshop, its role within the larger scope of the NGGDPP, and how workshop attendees can participate in the nationwide data-preservation program by applying for grants and using tips from successful proposals to the NGGDPP.

Further presentations by USGS personnel included management of physical collections from **Betty Adrian** of the USGS Core Research Center in Denver, Colorado; best practices in data preservation from **Brian Buczkowski** of the USGS Coastal and Marine Geology Science Center in Woods Hole, Massachusetts; an introduction to the National Digital Catalog from **Sky Bristol** of the USGS Geographic Information Office in Denver; and a description of the National Geologic Map Database from **Dave Soller** of the USGS in Reston. An overview of the workshop is posted online at **http://igs.indiana.edu/gdpt2009/index.cfm**; the complete program, along with PowerPoint presentations from all of the speakers, can be downloaded from **http://hdl.handle.net/2022/6471**.

For more information, please visit the USGS NGGDPP Web site at **http://datapreservation.usgs.gov/**.

Publications

Recently Published Articles

Barnhardt, W.A., Andrews, B.D., Ackerman, S.D., Baldwin, W.E., and Hein, C.J., 2009, High-resolution geologic mapping of the inner continental shelf; Cape Ann to Salisbury Beach, Massachusetts: U.S. Geological Survey Open-File Report 2007-1373 [**http://pubs.usgs.gov/of/2007/1373/**].

Carniel, S., Warner, J.C., Chiggiato, J., and Sclavo, M., 2009, Investigating the impact of surface wave breaking on modeling the trajectories of drifters in the northern Adriatic Sea during a wind-storm event: Ocean Modelling, v. 30, no. 2-3, p. 225-239, doi:10.1016/j.ocemod.2009.07.001 [**http://dx.doi.org/10.1016/j.ocemod.2009.07.001**].

Conzelmann, C., Steyer, G.D., Comeaux, M., and Suir, K., 2009, CRMS mapping applications and the Google Maps Application Programming Interface (API); an alternative to the traditional Web form: Data Integration and Management on the Gulf of Mexico Workshop, Corpus Christi, Tex., May 15-16, 2009, Proceedings [**http://cs.tamucc.edu/dim/docs/papers/Craig%20Conzelmann.doc**].

Hein, J.R., 2009, Caroline Islands, *in* Gillespie, R.G., and Clague, D.A., eds., Encyclopedia of islands: Berkeley, University of California Press, p. 148-150.

Hein, J.R., 2009, Phosphate islands, *in* Gillespie, R.G., and Clague, D.A., eds., Encyclopedia of islands: Berkeley, University of California Press, p. 738-740.

Herman, P., and Jenkins, J.A., 2009, DNA analysis to determine sturgeon species:

(Recently Published continued on page 9)

(Recently Published continued from page 8)

U.S. Fish and Wildlife Service Fish Lines Newsletter, v. 7, no. 4, p. 7-8 [**http://www.fws.gov/midwest/Fisheries/library/fishlines.htm**].

Hinderstein, L.M., Puglise, K., Zawada, D., Dowgiallo, M.J., and Martinez, F.A., 2009, Mesophotic coral ecosystem research strategies [abs.]: Association of Marine Laboratories of the Caribbean (AMLC) Scientific Conference, 34th, Roseau, Commonwealth of Dominica, May 25-29, 2009, Program and Abstracts, p. 12.

Hunnicutt, C.B., Thatcher, C.A., Chimmula, S., and Wilson, S.A., 2009, Bringing environmental data to the Web; National Wetlands Research Center project-focused web sites/viewers: Data Integration and Management on the Gulf of Mexico Workshop, Corpus Christi, Tex., May 15-16, 2009, Proceedings [**http://cs.tamucc.edu/dim/docs/papers/Christina%20Hunnicutt.doc**].

Jenkins, J.A., Goodbred, S.L., Sobiech, S.A., Olivier, H.M., Draugelis-Dale, R.O., and Alvarez, D.A., 2009, Effects of wastewater discharges on endocrine and reproductive function of western mosquitofish (*Gambusia* spp.) and implications for the threatened Santa Ana sucker (*Catostomus santaanae*): U.S. Geological Survey Open-File Report 2009-1097, 46 p. (revised, May 2009) [**http://pubs.usgs.gov/of/2009/1097/**].

Kilbourne, K.H., Moyer, R.P., Quinn, T.M., and Grottoli, A.G., 2009, Testing coral-based tropical cyclone reconstructions; an example from Puerto Rico [abs.]: International Summit on Hurricanes and Climate Change, 2nd, Corfu, Greece, May 31-June 5, 2009, Aegean Conferences Series, v. 41, abstract 49, p. 69.

Krauss, K.W., Duberstein, J.A., Doyle, T.W., Conner, W.H., Day, R.H., Inabinette, I.W., and Whitbeck, J.L., 2009, Site condition, structure, and growth of baldcypress along tidal/non-tidal salinity gradients: Wetlands, v. 29, no. 2, p. 505-519, doi:10.1672/08-77.1 [**http://dx.doi.org/10.1672/08-77.1**].

Krebs, J.M., Brame, A.B., and McIvor, C.C., 2008, Habitat use by nekton assemblages in natural versus altered wetlands; establishing baseline community conditions for wetland restoration in Tampa Bay, Florida: U.S. Geological Survey, South Florida Information Access (SOFIA), **http://dl.cr.usgs.gov/tampa/prod_search_tampa.aspx?prodid=22439**.

Moyer, R.P., 2009, Carbon isotopes and trace elements in small mountainous rivers and coastal coral skeletons in Puerto Rico: Marine Geoscience Leadership Symposium, 1st, Washington, D.C., March 23-27, 2009, Proceedings.

Storlazzi, C.D., Field, M.E., Bothner, M.H., Presto, M.K., and Draut, A.E., 2009, Sedimentation processes in a coral reef embayment; Hanalei Bay, Kauai: Marine Geology, v. 264, no. 3-4, p. 140–151, doi:10.1016/j.margeo.2009.05.002 [**http://dx.doi.org/10.1016/j.margeo.2009.05.002**].

Wendt, James, Oglesby, D.D., and Geist, E.L., 2009, Tsunamis and splay fault dynamics: Geophysical Research Letters, v. 36, L15303, doi:10.1029/2009GL038295 [**http://dx.doi.org/10.1029/2009GL038295**].

Whitman, R.L., Przybyla-Kelly, Katarzyna, Shively, D.A., Nevers, M.B., and Byappanahalli, M.N., 2009, Hand-mouth transfer and potential for exposure to *E. coli* and F+ coliphage in beach sand, Chicago, Illinois: Journal of Water and Health, v. 7, no. 4, p. 623-629, doi:10.2166/wh.2009.115 [**http://dx.doi.org/10.2166/wh.2009.115**].

Zawada, D.G., Hearn, C.J., and Piniak, G.A., 2009, Roughness spatial variability within and between reefscapes [abs.]: Association of Marine Laboratories of the Caribbean (AMLC) Scientific Conference, 34th, Roseau, Commonwealth of Dominica, May 25-29, 2009, Program and Abstracts, p. 33.

Publications Submitted for Bureau Approval

Balentine, K.M., Anderson, G.A., and Smith, T.J., III, Influence of tidal flooding on propagule dispersal of the red mangrove (*Rhizophora mangle*) in Everglades National Park, FL, USA [abs.]: Coastal and Estuarine Research Federation (CERF) Biennial Conference, 20th, Portland, Oreg., November 1-5, 2009.

Barkan, Roy, and ten Brink, Uri, Tsunami simulations of the 1867 Virgin Islands earthquake; constraints on epicenter location and fault parameters: Bulletin of the Seismological Society of America.

Barnard, P.L., and Warrick, J.A., Dramatic beach and nearshore morphological changes due to extreme flooding at a wave-dominated river mouth: Marine Geology.

Bearman, J.A., Foxgrover, A.C., Friedrichs, C.T., and Jaffe, B.E., Factors controlling spatial and temporal trends in tidal flat shape in south San Francisco Bay [abs.]: Biennial State of the San Francisco Estuary Conference, 9th, Oakland, Calif., September 29-October 1, 2009.

Buscombe, Daniel, Rubin, D.M., and Warrick, J.A., A universal approximation to grain size from images of non-cohesive sediment: Journal of Geophysical Research.

Draut, A.E., and Clift, P.D., Basins in arc-continent collisions, *in* Busby, Cathy, and Azor, Antonio, eds., Recent advances in tectonics of sedimentary basins: Hoboken, N.J., Wiley-Blackwell.

Draut, A.E., Hart, P.E., Lorenson, T.D., Ryan, H.F., Wong, F.L., Sliter, R.W., and Conrad, J.E., Late Pleistocene to Holocene sedimentation and hydrocarbon seeps on the continental shelf of a steep, tectonically active margin, southern California, USA: Marine Geophysical Researches.

Finlayson, D.P., and Jaffe, B.E., Bathymetry and acoustic backscatter of the mud flats between the Dumbarton Bridge and the Hetch-Hetchy Aquaduct, south San Francisco Bay, California [abs.]: Biennial State of the San Francisco Estuary Conference, 9th, Oakland, Calif., September 29-October 1, 2009.

Fregoso, T.A., and Jaffe, B.E., What have we done to the Bay? Anthropogenic impacts on net sediment volume change in central San Francisco Bay, 1855-1979

(Publications Submitted continued on page 10)

Publications, continued

(Publications Submitted continued from page 9)

[abs.]: Biennial State of the San Francisco Estuary Conference, 9th, Oakland, Calif., September 29-October 1, 2009.

Grantz, Arthur, Hart, P.E., and Childers, V.A., Geology and tectonic development of the Amerasia and Canada Basins, Arctic Ocean: Geological Society of London Memoir.

Hutchinson, D.R., Boswell, Ray, Collett, Tim, Dai, J., Dugan, B., Frye, Matt, Jones, E., McConnell, Dan, Rose, K., Ruppel, C., Shedd, Bill, Shelander, D., and Wood, W., Gas hydrate drilling targets at GC781, northern Gulf of Mexico; site selection report: Initial Reports, JIP Drilling, U.S. Department of Energy.

Hutchinson, D.R., Boswell, Ray, Collett, Tim, Dai, J., Dugan, B., Frye, Matt, Jones, E., McConnell, Dan, Rose, K., Ruppel, C., Shedd, Bill, Shelander, D., and Wood, W., Gas hydrate drilling targets at GC955, northern Gulf of Mexico; site selection report: Initial Reports, JIP Drilling, U.S. Department of Energy.

Hutchinson, D.R., Boswell, Ray, Collett, Tim, Dai, J., Dugan, B., Frye, Matt, Jones, E., McConnell, Dan, Rose, K., Ruppel, C., Shedd, Bill, Shelander, D., and Wood, W., Gas hydrate drilling targets at WR313, northern Gulf of Mexico; site selection report: Initial Reports, JIP Drilling, U.S. Department of Energy.

Martini, M., Armstrong, B., and Warner, J.C., High-resolution near-bed observations in winter near Cape Hatteras, North Carolina: MTS/IEEE OCEANS '09 Biloxi Conference, Biloxi, Miss., October 26-29, 2009, Proceedings.

Prouty, N.G., Field, M.E., Jupiter, S.D., and McCulloch, M.T., Coral proxy record for decadal scale reduction in base flow from Moloka'i, Hawai'i: Geochemistry, Geophysics, Geosystems.

Smith, T.J., III, Anderson, G.H., Balentine, K., and Tiling, G., Major ecosystem changes in the coastal Everglades; causes and consequences [abs.]: Coastal and Estuarine Research Federation (CERF) Biennial Conference, 20th, Portland, Oreg., November 1-5, 2009.

Tiling, G., Smith, T.J., III, Balentine, K., Anderson, G., Foster, A., and Ward, G., Development of a geodatabase to preserve and manage historic and recent information for the costal Everglades and assess scenarios of future climate change impacts [abs.]: Coastal and Estuarine Research Federation (CERF) Biennial Conference, 20th, Portland, Oreg., November 1-5, 2009.

Winters, W., Walker, M., Hunter, R., Collett, T., Boswell, Ray, Waite, W., Torres, M., Patil, S., and Dandekar, A., Physical properties of sediment from the BPXA-DOE-USGS Mount Elbert gas-hydrate stratigraphic test well: Journal of Marine and Petroleum Geology.

Xu, J.P., Normalized velocity profiles of field-measured turbidity currents: Geology.

Yates, X., Nayegandhi, A., Brock, J.C., Sallenger, A.H., Klipp, E.S., and Wright, C.W., ATM coastal topography—Louisiana, 2001; UTM Zone 15: U.S. Geological Survey Data Series (DVD).

Yates, X., Nayegandhi, A., Brock, J.C., Sallenger, A.H., Klipp, E.S., and Wright, C.W., ATM coastal topography—Louisiana, 2001; UTM Zone 16: U.S. Geological Survey Data Series (DVD).

Zawada, D., Reef roughness, *in* Hopley, D., ed., Encyclopedia of modern coral reefs; structure, form, and process: New York, Springer Verlag. ❁